BETTER FRUIT

VOLUME XI DECEMBER, 1916 NUMBER 6

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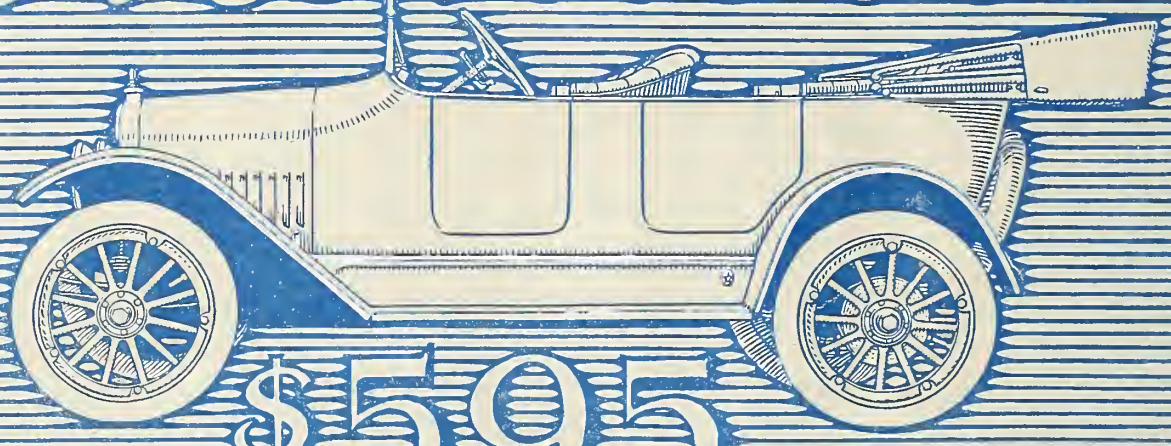

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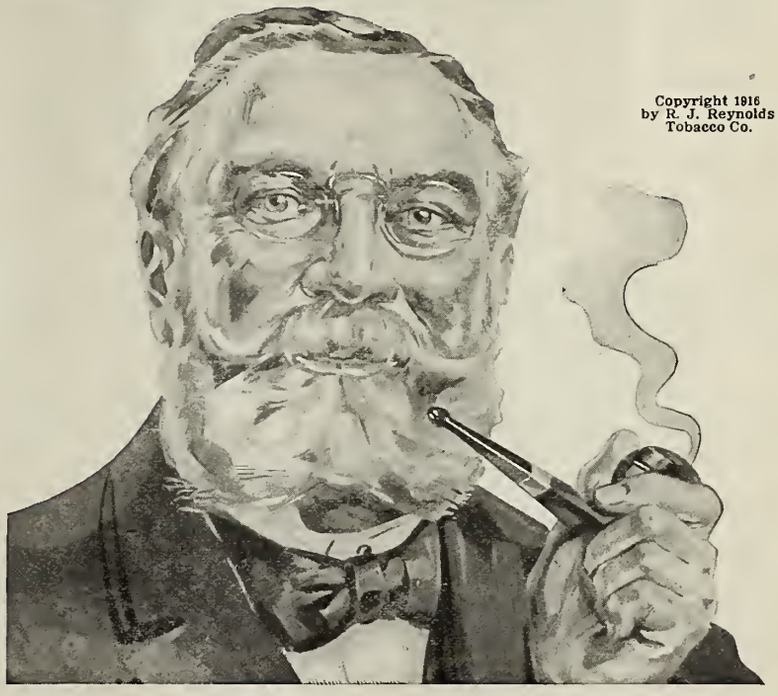

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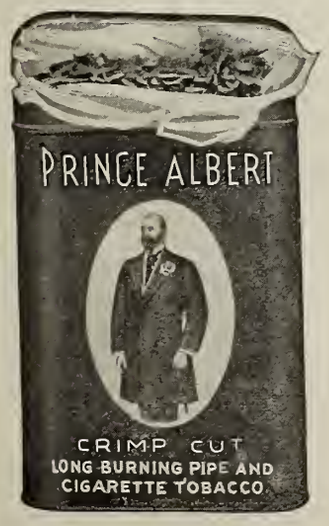

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BETTER FRUIT

AN ILLUSTRATED MAGAZINE PUBLISHED MONTHLY IN THE INTEREST OF MODERN, PROGRESSIVE FRUIT GROWING AND MARKETING

Consideration of the "Bulk" Pruning Question

By V. R. Gardner, Professor of Pomology, Oregon Agricultural College, Corvallis

ANYONE who has had occasion to make a somewhat careful survey of literature pertaining to pruning fruit trees realizes the improbability, if not almost the impossibility, of advancing an entirely new idea on the subject. It has been discussed so often that something has been said on almost every phase of the question. Furthermore, the literature on pruning shows that there is hardly any practice followed, or any theory held, about which there are not opposite views. It may almost be said that the literature of pruning is very largely a record of opinions formed, of views held, rather than a record of facts ascertained and principles established. What is needed in a difficult field like that of pruning is, first, the collection of a large body of facts—facts that are presented just as they are found, uncolored by any opinions or theories regarding their explanation. Once in possession of such a large body of facts, it should be possible carefully to analyze and interpret them. Perhaps it is too much to expect that we may learn all that they have to teach, but certainly there should be a few lessons that we can draw from them. Fortunately we are not entirely without data regarding certain pruning operations. The difficulty has been that in too many cases the amount available has been too small to warrant the conclusions that have been reached. Sometimes, too, a large amount of evidence has led to erroneous conclusions because considered from unfortunate points of view, or because closely related facts have not been taken into consideration. Viewpoint is often as important to a correct interpretation of evidence as is the accumulation of additional data that bear on the question.

It is not the intention in this article to present a large body of new data. Time is not available for a detailed presentation of all the evidence, nor is it necessary in this instance. The illustrations cited are simply representative of examples that without doubt the reader has seen duplicated in many orchards in many parts of the country. In other words, the full body of facts here called in evidence includes the observations and experiences of many fruit growers and investigators. The object of the article is rather to suggest a point of view for a consideration of this evidence. It is not claimed that it is a new point of view, but it is one that without doubt is given too little consideration by those directing, or engaged in, pruning our orchard trees.

Pruning Considered As an Operation Affecting the Tree As a Whole.

In pruning practice and in the consideration of pruning problems, outside of those dealing with the healing of wounds, most people look upon pruning as something directly affecting the tree as a whole. We speak of pruning this tree heavily and that one lightly; of heading back one and thinning out another; of winter pruning in one instance and summer pruning in another. We say that a certain tree that has been neglected for a number of years requires a heavy pruning to bring it back to a vigorous productive condition. Such a statement is made regardless of the fact that while possibly certain parts of the tree should be pruned heavily, certain other parts should be pruned lightly, if at all. Taking it for granted that heavy pruning is synonymous with large cuts and much brush left on the ground, we proceed to do rather heroic work. If a tree thus pruned fails to attain quickly the vigorous productive condition we have in mind as an ideal, we wonder why the result has not been satisfactory, especially when general opinion seemed to be that heavy pruning was required. On the other hand, when it is decided that another tree requires only a light pruning, we proceed to take out only a very few branches, and consider it fortunate that so little work is required. If such a pruning is attended by some of the results usually accompanying a heavy pruning again we wonder why. These statements, which will be recognized as based upon very general experience, serve to illustrate the fact that pruning is looked upon as a kind of bulk problem—as something which is decided upon for the tree as a whole, done to the tree as a whole, and to which the tree as a whole responds. It is some of the negative evidence on this question with which this article is mainly concerned.

Evidence From the Results Following "Dehorning."

Everyone who has had much experience in pruning fruit trees, and many who have been simply casual observers, have seen trees that have been more or less severely cut back or "dehorned," as it is called when the cutting back has been very heavy. In fact, this is the kind of pruning with which some people are best acquainted. The type of growth that almost invariably follows such pruning is well known. If the dehorning has been done in winter or early spring, numerous comparatively upright shoots will be produced during the following summer. The usual practice is to thin out these shoots and head back those that are left, the idea being to develop as quickly as possible new fruiting branches. Thus is the tree reinvigorated—"rejuvenated." So well is this procedure understood that we regard as practically settled the questions as to when and how to rejuvenate our trees. We assume that the tree as a whole responds to the treatment given, and there the matter rests. But does the tree as a whole respond? And is the whole matter to be thus summarily dismissed? Even a cursory examination of a tree that has been recently dehorned shows that only a part of the tree has responded. Because it happens to be the part upon which we have, through habit, come to focus our attention makes it none the less a part, and not the whole tree. Undisturbed branches in the lower part of the dehorned tree usually continue to grow in the ordinary way. As a rule their spurs bear flowers and fruit no more regularly and yield a product of no better grade than before. Their older spurs and smaller fruiting branches are nearly as prone as ever to become gradually weaker and die. Apparently neither as whole branches nor in their separate parts have these branches in the lower part of the tree been accelerated or retarded in growth. The chances are that they have not even produced watersprouts, such as have developed so abundantly on the dehorned branches above them. In other words, there is an important portion of the tree, often its most important portion, that has apparently not been affected by the dehorning, either for better or for worse. Though the tree as a whole has been pruned heavily, a large part of the tree has not felt the influence of the pruning. Dehorning has not rejuvenated the whole tree; it has resulted merely in the production of new wood to replace a portion of the old top.

Evidence From Results Following Partial "Dehorning."

Even more striking evidence on this question of the distance to which the influence of pruning extends is furnished by trees that have been partially dehorned, i.e., have had a portion of their branches cut back very severely and other branches of equal size and that reached to an equal height left untouched. In such instances what we have come to regard as the characteristic results of dehorning usually are limited almost entirely to the branches that have been cut back. These branches give rise to watersprouts in abundance, but the unpruned branch continues to grow and function as though nothing

had been done to upset the normal course of events in the tree. The case presented is that of a single branch, or several branches, immediately surrounded by the effects of a particular type of pruning and yet neither having received a stimulus from the pruning itself or an influence from the new vegetative growth resulting from it. So far as results are concerned, they may be compared with those following the occurrence of a frost in some region. Because of elevation or location, killing temperatures are not reached and vegetation is not injured in a particular orchard, though neighboring orchards possessing the same kind of soil, containing the same varieties, swept by the same prevailing winds and falling within the same general storm areas may have their new growth entirely destroyed. Another particular orchard receives no benefit from a rain coming at a critical time, if just before reaching the orchard the path of the storm is turned in another direction by a momentary shift in the air currents. Similarly a particular limb is apparently little benefited or injured by the pruning shears or saw that greatly injures or benefits, or even entirely removes, the surrounding or neighboring limbs. All have seen examples of the point that is made here in old trees of one species or another that were being top-worked, where the top-working was being distributed over a period of several years. The heavy pruning that such trees receive, incident to the top-working process, usually is not reflected to any appreciable extent in a changed manner of growth on the part of the ungrafted limbs. On the contrary, the influence of the heavy pruning is apparently mainly limited to an area close to the point of insertion of the scions. This seems to be true not only for the first season, but for as long as the tree remains in a partially top-worked condition.

Evidence From the Type of Pruning That Entirely Removes a Few Large Limbs.

If there is a type of pruning that lies at the opposite extreme from the cutting back to stubs of a number of large limbs for purposes of grafting and at the same time leaving one or more large limbs uninjured to help temporarily to maintain a balance between top and root, it probably consists in the entire removal of one or more comparatively large limbs, the majority of the limbs being left unpruned. This may be considered a kind of bulk thinning. In a way it is the converse of the bulk heading back practiced in dehorning. Few will fail to recognize it as a type of pruning commonly employed by many fruit growers. It at least possesses the advantage of requiring little labor. At first thought one might imagine that if bulk heading back influences only certain parts of the tree and not the tree as a whole, certainly bulk thinning out should operate in an opposite manner. However, let us see whether or not it does. When a single large limb is removed from almost any part of a tree, watersprouts develop to take its place, and the rest of the tree top continues to grow much as though no pruning had been given. Attention is again called to the point of origin of these watersprouts. They spring, in the main, not from limbs far removed from the pruning wound, but close to where the cut was made. There is an unmistakable response to the bulk thinning, but that response is evident within a very limited area. The tree as a whole does not show it.

Those who have intentionally or unintentionally permitted a leader to develop for a number of years and form close-centered trees and have then tried to train them as open-centered or vase-shaped trees can furnish abundant evidence on the question under discussion. The removal of the central leader from trees of this kind (bulk heading back or bulk thinning out, depending upon the form of the tree and where the cut is made), is almost always followed by the production of a number of watersprouts that attempt to take the place of the removed leader. The subsequent removal of these watersprouts is followed by the production of still other watersprouts, nearly always springing from points near the wound left by the removal of the leader. On the other hand, the unpruned branches of the tree seem to be little influenced by the cutting out of the leader.

What has just been said regarding the bulk pruning of old trees apparently holds true for younger trees, though perhaps to not quite the same degree. When trees that have not yet reached bearing age, or that are just coming into bearing, have one of their larger limbs entirely removed in order to train them to a desired shape, new shoots usually start to take the places of the limbs that have been cut out. Those who have had any considerable experience in attempting to develop open-centered Yellow Newtown apples or Bartlett or Anjou pears, or close-centered McIntosh apples or Winter Nelis pears, know how difficult it is to keep shoots and limbs from growing up in the center in the first instance, and from spreading out and even growing down in the second, by simply cutting them out or off; and, what is of equal or greater importance, make the other shoots and limbs of these same trees spread out or grow upright, as the case may be, and thus profit by the food materials that it is desired to divert from the closely pruned parts. In fact, so persistent are the watersprouts in attempting to replace removed limbs that many careful growers are coming to realize that the easiest way to develop an open-centered tree is not to cut out all of the growth in the center, but rather to simply suppress it by pruning it a little more severely than the surrounding branches that are desired to form the main framework of the tree. Even then it is to be doubted if the normal growth of the remaining branches is materially changed. Similarly, when young trees are lightly, or even heavily, headed back, new shoots are sent out, but mainly from points where some of them can easily replace the portion removed. It is not usual for distant portions of the tree to show a clear cut response to the pruning.

It may be argued that when the thinning out and heading back that are usually afforded very young trees is practiced, the tree as a whole responds to the treatment — sometimes nearly every bud starting to vegetate. Without doubt such trees are influenced as a whole by the pruning given them, but it must be remembered that every part of such trees is pruned; and that probably the tree is influenced as a whole only because each part is separately and distinctly influenced.

Evidence From Spur Pruning.

Also bearing on this same question are the results that are obtained from what might be termed "spur pruning." As they become older, some varieties of apple and pear trees are very prone to develop large numbers of fruit spurs, spurs that often branch and rebranch until they become fruit spur clusters rather than individual spurs. If more or less neglected, such trees finally reach the state where they make hardly any new shoot growth, practically their entire energies being absorbed by their fruit spur systems. Usually when there are such large numbers of fruit spurs but a comparatively small percentage can flower and fruit in any single season, and the record of any single spur, or even spur cluster, especially in the older parts of the tree, would show very irregular fruiting. Such trees present a condition in which, though there is little of what we commonly speak of as vegetative growth, nearly all of the energies of the tree are really being absorbed in a slow vegetative growth of the spurs. The engineer would say that the fruiting machine is so large and complicated that nearly all the power is required to overcome friction; consequently but a small portion of a full load can be carried. The economist would say that it is an instance of the trees using up most of their income in their own overhead charges. Such of course is recognized as the condition that many seek to remedy by dehorning or by some other type of bulk pruning. That bulk pruning is only a partial remedy has already been pointed out. Some have seen the experiment tried of removing a part of the spurs from such trees—a half, or two-thirds, or even three-fourths of them. As the spurs possess a very large percentage of the normal growing points and bear practically all the leaf system of a tree in such a condition, it will readily be seen that such a thinning of spurs is really the equivalent of a heavy pruning, except perhaps in the total weight of wood tissue removed. Treated in this way, trees do not produce watersprouts, as they do when dehorning or the removal of a few large branches takes away an equivalent number of growing points. In fact, they produce very few watersprouts. However, the remaining spurs show a much more vigorous growth and the new shoot growth that develops from normal lateral and terminal buds is much longer and more vigorous. The net result is that the tree is changed

Continued on page 28

Maintaining Soil Fertility Largely A Local Problem

A. G. Craig, Before the Washington State Horticultural Association, Wenatchee, Washington, December 9, 1914

THE experiment stations of the states of the United States and of Europe have devoted more attention to the subject of fertilizers and soil fertility than any other subject in the annals of agriculture. Farmers and fruit growers have also expended vast sums of money experimenting with commercial fertilizers. The results of the experiments have been somewhat contradictory and the literature on the subject is more or less confusing. This is proof that the subject of maintaining soil fertility is more or less of a local problem.

We often hear it said that Washington soils are well-nigh inexhaustible, and indeed it is true that they are rich in many of the elements of fertility. But we now know from experience that the continuous cropping of wheat in the Willamette Valley in Oregon has reduced the yield of wheat from sixty bushels per acre to as low as ten bushels per acre. This is true to a smaller degree in our own fertile wheat belt. The following is copied from Bulletin No. 121, Pennsylvania State College Agricultural Experiment Station:

"There is an important need for fertility in any orchard that is actively producing and growing. The actual extent of this need can be approximated chemically by determining the average composition of apple wood, leaves and fruit, and by applying these figures to what may be considered good annual amounts of these products. This we have done both for apples and for a 25-bushel crop of wheat, with results shown in Table I. The annual weights for apples are based on a yearly production of 100 pounds each of wood and leaves, and of fourteen bushels of apples per mature tree. All these amounts are distinctly less than those actually observed and reported, but inasmuch as they give an annual yield of 490 bushels per acre of thirty-five trees they are considered sufficient for the present purpose.

"In the first place it will be noted that in total food draft the apples exceed the 25-bushel wheat crop in every constituent except phosphoric acid, and in that they fall behind by only half a pound. Notwithstanding this fact, the trees are usually able to maintain themselves much better and longer than wheat. This is probably largely because of their much longer season of root activity, their more natural demands, the annual return of most of the plant food in their leaves, and their ability to curtail production for one or more seasons when conditions become unfavorable. Without going into details, however, it is quite evident that very important amounts of plant food are annually removed by an apple orchard. Scarcely any soil can furnish all these materials indefinitely in the amounts and at the times required, and unless proper assistance is rendered there must come a time when production is materially reduced and off seasons occur.

"Returning to the table, it is of interest to note the relatively large amounts of nitrogen, potash and lime, and the comparatively small amount of iron annually taken up by the apples. Nearly all the lime remains in the wood and leaves, while a large proportion of the potash finds its way to the fruit.

"This large amount of lime seems to have some significance, so far as the wood is concerned, because, as shown later in several of our experiments, its application has resulted in considerable improvement in growth. In the fruit, however, very little lime is required, and hence its application should not be expected to affect the yields materially, and this corresponds with our field results. Moreover, the total effect of adding lime alone is surprisingly small, in comparison with the large amounts that are taken up. Either these amounts are merely drawn in and deposited mechanically by the transpiration stream, and hence are largely without physiological significance, or else the average soil is still able to supply the needed lime.

"In view of the large amount of potash carried by the fruit, one might suppose that its addition to the soil would be very important in improving yields, and this idea has been widely proclaimed, especially by those considering only the chemical composition of the fruit. As indicated later, however, it seems that most orchard soils are already sufficiently supplied with potash in available forms and that the chief shortages occur in the nitrogen and phosphates. This is the case notwithstanding the fact that the latter materials are actually required in considerable smaller amounts.

"From these facts it is evident that there is comparatively little relation between response and total requirements in the case of plant food and that something more than a knowledge of the chemical composition of the fruit and wood is needed before one can properly fertilize an orchard. Even with the additional knowledge of the composition of the soil, the problem is not much simplified, because it is impossible as yet to duplicate sufficiently the conditions existing in any soil. A chemist may determine the total amounts of plant food present, but he cannot yet determine their actual availability to the trees with sufficient accuracy to be of much value.

"The practical and proper fertilization of an orchard, therefore, becomes an experimental problem, and its solution is dependent primarily upon the pomologist or horticulturist, supplemented by local tests. In other words, the question is not so much what amounts of plant food are annually taken up, nor what amounts are present, but rather it is what responses are made when certain kinds and quantities of plant food are actually added to an orchard soil."

Results From the Johnson Orchard Experiment.

"In this experiment fertilizers were applied per acre as follows: Actual nitrogen, 50 pounds; actual phosphoric

TABLE I.—THE RELATIVE PLANT-FOOD DRAFT OF WHEAT AND APPLES.
(In pounds per acre annually, based on American and German averages.)

	Wheat Grain Lbs.	*Wheat Total* Lbs.	*Apple Wood* Lbs.	*Apple Leaves* Lbs.	*Apple Fruit* Lbs.	*Apple Total* Lbs.
Annual weights	1,500	4,200	3,500	3,500	24,500	31,500
Nitrogen (N)	30.0	43.7	11.3	25.6	16.2	53.1
Phosphoric acid (P_2O_5)	10.0	15.8	3.6	5.3	6.4	15.3
Potash (K_2O)	9.8	26.8	6.6	15.9	41.5	64.0
Lime (CaO)	0.84	8.0	29.1	29.5	3.0	61.6
Magnesia (MgO)	3.0	6.1	4.4	8.9	3.4	16.7
Iron (FeO)	...	...	0.5	1.5	0.8	2.8

TABLE II.—INFLUENCE OF FERTILIZATION ON YIELDS (JOHNSON ORCHARD).
(Yields in pounds per plat and bushels per acre annually, 1908-1912.)

Plat:	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
	Check Lbs.	*Nitrogen and Phos.* Lbs.	*Nitrogen and Potash* Lbs.	*Check* Lbs.	*Phos. and Potash* Lbs.	*Comp. Fertilizer* Lbs.	*Check* Lbs.	*Manure* Lbs.	*Lime* Lbs.	*Check* Lbs.
1908	90	528	237	446	57½	759	211	278	558	106
1909	675	6,018	5,257	1,932	3,089	6,621	2,008	3,531	1,216	1,266
1910	2,575	3,265	1,822	3,168	3,552	2,108	1,629	6,149	3,185	3,505
1911	283	7,563	7,816	617	1,227	8,209	1,362	4,874	388	106
1912	1,024	1,225	696	1,382	1,385	189	1,226	6,698	741	474
Totals 4 years	4,557	18,071	15,591	7,099	9,253	17,127	6,225	21,252	5,530	5,351
Average yield per acre (bushels)	136.7	542.1	467.7	213.0	277.6	513.8	186.7	637.5	165.9	160.5
Gain over av. check	.....	377.9	293.5	.....	103.4	339.6	.....	463.3	—8.3	.....

TABLE III.

Produce	*Pounds—Nitrogen*	*Potash*	*Phos.*	*Market Value—Nitrogen*	*Potash*	*Phos.*	*Total*
Wheat, 25 bushels	36	7	6	$ 7.20	$0.35	$0.75	$ 8.30
Wheat straw, 1 ton	10	14	2	2.00	.85	.25	3.10
Vetch hay, 3 tons	120	125	14	24.00	6.25	1.68	31.93
Alfalfa hay, 6 tons	300	150	25	60.00	9.00	3.00	72.00
Timothy, 2 tons	48	48	6	9.60	2.75	.75	13.10
Potatoes, 200 bushels	40	60	7	8.00	3.69	.85	12.45
Apples, 300 bushels	90	82	11	18.00	4.90	1.35	24.25
Fat cattle, 1,000 pounds	25	1	7	5.00	.05	.85	5.90
Milk, 10,000 pounds	57	12	7	11.40	.75	.85	13.00
Butter, 500 pounds	1	0.1	0.2	.20	.01	.02	.23
Fresh kale, 30 tons	240	190	50	48.00	9.50	6.00	63.50

acid (P_2O_5), 100 pounds; potash (K_2O), 150 pounds; lime, 1,000 pounds; manure, 12 tons.

"In Table II is given the yields obtained from some of the above applications during the past five years. These results were obtained from an experiment with Baldwins, now twenty-four years of age, located on a volusia silt loam in Lawrence County, north of Pittsburgh. On first inspection these trees did not seem to be suffering especially from a lack of plant food, but they had not been bearing satisfactorily and their annual twig growth was averaging only about an inch, with occasional maximum growths of five or six inches. These rates of growth are continuing on the checks or unfertilized plats, but they have been practically tripled on the plats receiving proper fertilization.

"In estimating the influence of the treatments, the yields of the first year are excluded, because they can never be materially affected by the application of the first season. The yields, as shown in Table II, are given in pounds per plat, and also in bushels per acre, annually for the last four years.

"In the first place it will be noted that the average yields of the checks or unfertilized plats have run fairly uniform, producing an average annual yield of 174.2 bushels per acre during the last four years. Lime alone (at the rate of 1,000 pounds per acre annually) has shown no improvement over the average check, but as a matter of fact it has averaged 8.3 bushels per acre less, a deficit that is doubtless largely or wholly due to incidental causes and natural fluctuations. The phosphate and potash combination has affected the yield here rather distinctly. This may be due at least partly to a possible advantage in location, as indicated by the fact that its adjacent check is the highest producer among them and is averaging within 64 bushels of the phosphate-potash treatment. The growth on the latter plat, however, is nearly 3 per cent less than that of the normal unfertilized plat, and its general appearance is not appreciably superior to that of the checks. It is evident, therefore, that these trees are still vitally in need of something, although it will be noted that they are receiving the fertilization commonly advised for orchards, largely on the basis of chemical analyses.

"This need is being quite thoroughly met on the adjacent plat 6, which differs from number 5 only in the addition of nitrogen. The mere addition of nitrogen in this case has more than tripled the gain. Wherever nitrogen appears in the treatments very large yields are observed, and foliage and growth of the trees are also very satisfactory, the average gains in trunk girth ranging from 25 to 90 per cent.

"Plat 2, receiving nitrogen and phosprate only, at the present time shows a better gain than number 6, which receives potash in addition. This is directly connected with the almost complete crop failure that occurred in the latter plat this past season, and it is also doubtless partly attributable again to the natural fluctuations in yield. It shows, however, that no additional potash is needed in this orchard, so far as the yields are concerned.

"Phosphates are next in importance to nitrogen here, as indicated by the 42-bushel deficit that occurs on plat 3, as compared with number 6, when phosphorus is omitted in the former, and also by the high yields in plat 2. Manure, as a result of the extra large crop of 1912, when most of the other plats were having an off season, is now in the lead in this experiment, with the tremendous average yield of 637 bushels per acre annually for the past four years. This gives an annual gain over the check of 463 bushels per acre, which is a very satisfactory exchange for 12 tons of manure. This benefit from manure is doubtless largely due to its nitrogen content."

Fertility in Farm Produce.

In Table III, taken in part from Dr. Hopkins (Bulletin No. 123, Illinois Experiment Station) is given a statement of the composition and market value of the different plant foods carried by some common crops. From 50 to 95 per cent of the fertilizing constituents of food is recovered in the manure, depending upon the kind of animal fed. You can readily figure what fertility you are retaining on the farm by feeding the products.

Experiments by the United States Department of Agriculture indicate that with animals kept in stalls or pens throughout the year and the manure carefully saved, the approximate value of the fertilizing constituents of the manure produced by each horse or mule annually is $27, by each head of cattle $19, by each hog $12, by each sheep $2. These estimates are based on the values

Continued on page 26

Five Books Free

DO YOU WANT your fruit trees to grow faster, yield sooner and bear bigger crops. Our Tree book, "Better Orchard Tillage" shows how you can secure these results by blasting when planting.

OR DO YOU want to save money on your stump blasting? Do you want to get the stumps out cleaner—split them up better—and cut down the quantity of powder required? Our Stump book, "Better Stump Removing," tells and shows how to do it.

IF you want to save fertilizer and grow bigger crops, send for our Crop book, "Better Farm Tillage." It tells how blasting will make the subsoil mellow several feet deep and release new plant food for your crops.

ARE there rocks on your farm? Our folder, "Better Boulder Breaking," shows how a few minutes' work will get them out of your way forever.

DOES your farm need draining? Our Ditch book shows how to blast clean, smooth ditches of any size—the easiest, quickest way of making them.

GIANT FARM POWDERS
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made in two brands—Eureka Stumping and Giant Stumping—are used by thousands of farmers and fruit growers in Pacific Coast States because:

1. They are made especially to suit Western farm and orchard conditions.
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THE GIANT POWDER CO., Con.
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Distributors with magazine stocks everywhere in the West.

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Get a 25- or 50-pound case of either of the Giant Farm Powders. Get at the same time a case of any other dynamite or stumping powder.

Blast with each. Keep track of the quantities used. Figure the cost. You will find—as farmers everywhere have found—that the Giant Farm Powders save farmers time, work and money.

To make it easy for you to secure Giant Farm Powders, we print a trial order form in the coupon at the right. Fill it out, and we will have our nearest distributor supply you with a trial case at the lowest market price.

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The Giant Powder Co., Con.,
202 Kohl Bldg., San Francisco.
Send me your illustrated books on the subjects which I have marked X.

☐ Stump Blasting ☐ Tree Planting
☐ Boulder Blasting ☐ Ditch Blasting
☐ Subsoil Blasting

Trial Order Blank
(Kindly fill out if ready to purchase)
Have your nearest distributor supply me with

.....lbs. Giant Stumping Powder
.....lbs. Eureka Stumping Powder

NAME .....
ADDRESS .....
Write below your dealer's name.

The Physical Handling of Fruit—Packing Houses

By C. I. Lewis, Professor of Horticulture, Corvallis, Oregon

WE can divide packing houses into two classes, viz, those privately owned and those of the community plan. There are a number of types which one can consider in the class of privately owned houses. The first that I wish to call attention to is the tent. The tent is not used with the idea of a permanent house, but is of great value where one has young orchards coming into bearing, or where the financial conditions are such that it is impossible for a few years to build ample storage and packing facilities. For a small amount of money one can accomplish a great deal in a tent. Many growers in the Pacific Northwest for the past two years have used these very satisfactorily. To use a tent to the best advantage one should equip it with a sizing machine, in order that the fruit may be moved more rapidly. Mr. E. H. Shepard, a fruit grower of Hood River, gives a report of his experience in handling fruit in a tent. He was able to move nine carloads of fruit in thirty-four days in a tent which measured 30x40 feet. The top of the tent was made of 12-ounce duck, and the sides of 8-ounce. The tops and sides were sewed together in one piece, and the ends were made separately of 8-ounce duck. The cost of the tent itself was $80, the lumber $25, and labor $20, making a total cost of $125, which is a small sum of money to invest for the handling of 10,000 boxes of fruit. These tents will give service for a number of years, for when the season is over they can be taken down and stored in a dry place. Many growers are so situated that they prefer to build a regular packing house. There are many types of such; they may consist of mere sheds, or, on the other hand, they may contain cool storage, or even cold storage. By cool storage we mean that the fruit is kept cool by the use of cool air and proper ventilation, and by cold storage we mean ice or some form of mechanical refrigeration. A little further on I will give some suggestions concerning the details of the construction of storage houses. There are some advantages in having a packing house on your own place. It is very convenient to the point where the fruit is grown. It has one serious disadvantage, however, and that is that is it generally too expensive. It takes from $2,000 to $8,000 to build an average house which will furnish you with storage facilities that are adequate to keep the fruit in good condition. Of course you can build a packing shed for less money, but if you want to have any facilities for keeping fruit without causing it to deteriorate rapidly, it will take considerable money. On the other hand, you can work with your neighbors and build a plant which will be more efficient than you can afford to build and not nearly as much money will have been expended for each individual. The money that you have saved could be put into a permanent cold storage plant. In other words, we believe that the direction of packing house facilities in the Northwest will be along the lines of the construction of community packing sheds, and as soon as the fruit is handled in such sheds it will be transferred rapidly to a cold storage plant. We believe that by such an organization it will be possible to finance plants which would otherwise be impossible. Of course there are localities where it will be advisable to build combination plants, namely, those which are part packing and part storage. The community house has many advantages: First, it allows economy in the initial outlay and in operation; and second, it allows better work, since you can keep the help during the entire season, and you can generally give it a little better supervision, and can handle more tonnage in a short time. There is a chance for a division of labor. The neighbors can get together and one decide to take charge of picking, another charge of packing, another charge of grading, another charge of hauling, another charge of certain clerical duties. One can look after the hiring of help, and so on. As a rule much better equipment is found in the community houses than is found in the average house owned by the individual grower. There are some disadvantages, such as a longer haul for some people. We have not as yet worked out the best unit of co-operation. We know there are some houses that are accommodating five to a dozen orchardists to very good advantage. On the other hand, this year there will be houses in the Northwest which will accommodate from forty to sixty growers. Just how many growers can be accommodated in one shed to the best advantage is an open question. In other words, which will be the better policy, to build half a dozen very large community houses or fifteen or twenty smaller community houses? Probably the conditions in the different localities will settle that point to a large degree. The question of location of the community packing house is one which needs serious attention. In strictly orchard districts it is well to locate the house as nearly central as possible to the territory it will serve. In many other sections, however, it will be much better to locate the house along the lines of the railroad. Especially is this true if storage is to be added to the packing shed. There are many types of community houses. Some of them are mere packing sheds; others simply converted buildings, such as blacksmith shops, hop warehouses, and similar buildings. In some places they are planning to combine the warehouse storage for hay and grain with fruit-handling storage. Some combine packing with cool-air storage, and still others have packing, cool-air storage, and refrigeration. It is possible to start a community house with a very small amount of capital, or it is possible and sometimes advisable to put in considerable money and build a permanent building. I am going to give a few descriptions of the different types of houses, and a few suggestions concerning the adaptability of the same to the various localities of the Northwest.

The first house I want to call your attention to is known as the Pioneer Packing House, in the Oak Grove district at Hood River. Two years ago five young men of that locality formed a partnership. They did not have sufficient money to invest in a building, but used a large blacksmith shop in that locality. The building measured 20x80 feet, and was centrally located. Each man was equally interested in the partnership and had an equal voice in the management. One was selected as the foreman of the packing house, another was foreman of the picking crew, another had charge of the teaming between the orchard and the packing house, while another had charge of the accounts and attended to matters which needed attention in town. The apples for the members were handled at cost,

and the profits for those hauled for other parties were divided equally among the members. They ran a common picking crew and were in a position to handle the fruit of each member from the tree to the warehouse. All labor was hired by the hour. They made a flat charge of 20 cents a box for sorting, sizing, packing, nailing, furnishing paper, etc., and delivering to the warehouse in Hood River. All apples were delivered to the house in packing boxes with the owner's name stamped on each box, and this seemed to obviate confusion. The equipment consisted of a Palmer sizer, two box presses and one truck. The members state that they would not for a moment consider going back to the old way of each man handling his own fruit. They claim they are able to hold the same help from year to year, and are planning a little later on building a bunkhouse to handle the help. Instead of paying 5 cents a box for hauling, as they did formerly, they now do it for 2½ cents. They have also been able to do very good inspection of fruit at a minimum cost. They have demonstrated that they can pack their fruit together much cheaper than they can singly, and that they can afford to take care of some of their neighbors at a price which is attractive to them. The accompanying statement of the amount of work that has been done by the Pioneer Packing House in the past two years, as furnished by the secretary, Mr. George B. Gladden, will be of interest to those growers who are planning the formation of a similar plant.

PIONEER PACKING HOUSE—GENERAL SUMMARY FOR 1915

Continued from October issue.

Grower's Number	*200 and larger*	*Smaller than 200*	*Extra Fancy*	*Fancy*	*Choice*	*Cookers*
1	908	11	225	473	154	67
2	770	16	285	213	204	84
3	486	..	171	188	95	42
4	440	11	214	111	90	36
5	660	15	299	159	144	71
6	1,879	27	547	565	490	265
7	1,006	..	517	270	219	...
8	632	29	293	170	133	65
9	195	3	23	67	92	16
10	254	..	138	70	34	12
11	266	8	58	116	86	14
12	214	2	115	51	41	9
13	240	1	65	60	69	47
Totals	....	..	2,950	2,513	1,851	728
Percentages	....	..	36.7	31.3	23	9

COSTS:	*1915*	*1914*
Number of packed boxes	8,128	4,891
Supplies	$0.039	$0.035
Packing	.035	.04
Hauling to town	.035	.035
Overhead and depreciation	.117	.012
Haul store to shop	.0017	....
All other labor	.0583	.054
Totals	$0.176	$0.176

ITEMS OF PROFIT:	
3,319 boxes packed for members at $0.024 saving	$ 79.65
Boxes packed for others	128.32
Picking crew	9.24
Teamster	8.01
Total	$225.22

COSTS OF PICKING AND HAULING:		*Packed box*	*Loose box*
Grower No. 5:			
Cost of picking	$36.97	$0.0562	$0.0369
Cost of picking	9.41	.0137	.0092
Totals		$0.0699	$0.0461
Grower No. 11:			
Cost of hauling	$6.40	$0.0236	$0.0146
Cost of additional one mile		.0099	.0054
Grower No. 8:			
Cost of hauling	$11.35	$0.017	$0.0113
Cost of additional one-half mile		.0033	.0021

The only candied apple made in the United States is made from Western apples by a Western company. Process originated with Mrs. D. L. Pratt of Wenatchee, Washington. She was a judge of the Women's Department at the Spokane National Apple Show in 1914, where some home-made candied apples were entered for prizes. She returned home and worked out a proceess of her own, turning out a product that compared to advantage with any of the commercial candied fruits on the market. These she had as a surprise for her family Christmas reunion dinner. Her son, Randall S. Pratt, saw commercial possiblities in the product and perfected the process for commercial use at the chemical laboratory at the University of Washington. A company was formed, of which he is manager, and operates a factory at Hood River, Oregon, for this and other fruit products. Name, Fancy Fruit Products Co. Hundreds of boxes were sent east as Christmas souvenirs from the different apple districts last year and the factory was not able to fill all the orders. They have enlarged facilities this year and anticipate a still larger business. Are advertising in this issue to send Christmas boxes direct from factory to any point in the United States and enclose Christmas card.

Bean Double Giant

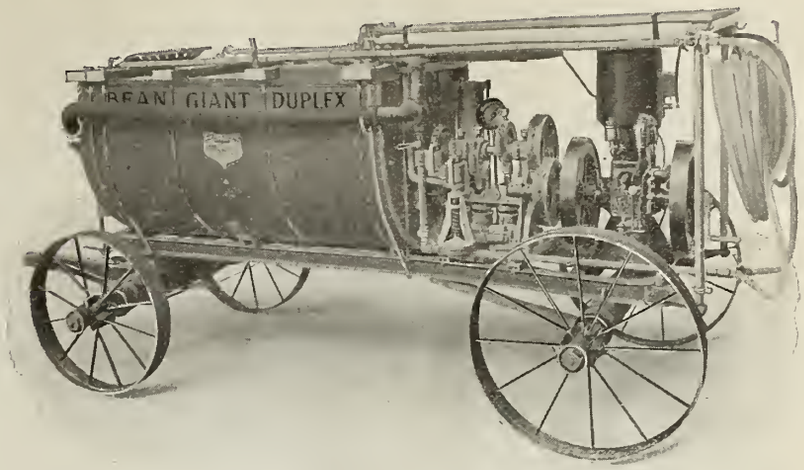
Capacity 25 gallons per minute, 400 lbs. pressure. Supplies 10 or 12 lines of hose.

Bean Giant Triplex

Capacity 8½ to 11½ gallons per minute, 200-250 lbs. pressure. Supplies 2 to 4 lines of hose.

Bean Giant Duplex

Capacity 6 gallons per minute, 250 lbs. pressure. Supplies 2 lines of hose.



Bean Power Sprayers

Bean Little Giant Duplex

Capacity 5 gallons per minute, 200 lbs. pressure. Supplies 2 lines of hose.

Bean Pony Duplex

Capacity 5 gallons per minute, 200 lbs. pressure. Supplies 2 lines of hose. (Overhead suction.)

Bean Eureka Sprayer

Capacity 2½ gallons per minute, 200 lbs. pressure. Supplies 1 line of hose. A one-man, one-horse outfit.

Bean Midget Sprayer

Mounted on skids. Capacity 2½ gallons per minute, 200 lbs pressure. Supplies 1 line of hose.

THE GROWERS IN YOUR SECTION WHO ARE PRODUCING THE LARGEST, CLEANEST AND MOST PROFITABLE CROPS ARE THE GROWERS WHO ARE EQUIPPED WITH THESE STURDY, EFFICIENT, HIGH-GRADE SPRAYERS

The almost universal use of Bean Power Sprayers throughout the Northwest is not merely a matter of chance. It's because the growers of this wonderfully productive section have learned that the Bean is an indispensable factor in the growing of the most and the best fruit. Clean trees are of vital importance—and nobody knows it better than the apple grower himself! It's such advantages as these that have made "Bean" and "best" synonomous with Northwest apple men:

Constant Pressure—Bean Prussure Regulator holds pressure at any desired point. When not spraying engine runs free, thus saving gasoline and wear and tear on engine and pump.

No Stuffing-Box—and hence, no stuffing-box troubles. Our cylinders are equipped with cup plungers.

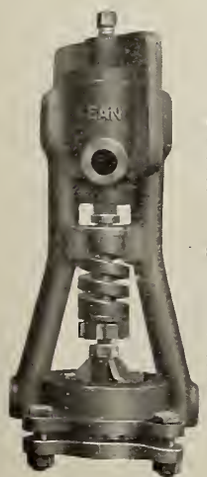
No Loss of Time—For example, any valve can be removed from pump under full pressure while engine is running. Many other time-saving features.

Flexible—The Bean is built low down and compact. It is easy to handle under all conditions.

Economical—Bean parts are interchangeable. Worn parts quickly, easily and cheaply replaced.

Heavy Pressure—All Bean Outfits are built to throw the liquid at heavy pressure so as to do effective work. Pressure guaranteed.

Bean Ball Safety Valve



For All Makes of Sprayers

A new safety valve embodying part of the features of the famous Bean Pressure Regulator.

Safe. Sure. Reliable.

Fits any make of sprayer.

Will end safety valve bother on your sprayer.

Mail your order direct to us. State whether you wish ½ or ¾-inch pipe connections.

$7.50
DELIVERED

Send for Our Complete New Catalog of Hand and Power Sprayers, Spray Hose, Accessories, Etc.

It illustrates and describes the entire Bean line, explains the many distinctive exclusive Bean features, and tells you everything you ought to know about spray pumps. Send the coupon—now. Also, see your nearest Bean dealer. We have representatives in all fruit-growing sections.

Bean Spray Pump Co.

213 W. Julian Street
SAN JOSE, CAL.

12 Hosmer Street
LANSING, MICH.

Bean Spray Pump Co.
213 W. Julian St.
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and am interested in
HAND PUMPS..... ACCESSORIES.....
POWER SPRAYERS.....

Name .....

Address .....

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ADVERTISING RATES ON APPLICATION

Entered as second-class matter December 27, 1906, at the Postoffice at Hood River, Oregon, under Act of Congress of March 3, 1879.

Two Grades of Apples.—Some time ago, editorially, the editor of "Better Fruit" advocated packing two grades of apples, stating he believed that growers would adopt this practice in the near future. Already the subject has been taken up and is being seriously discussed by growers in Yakima districts. The subject has been taken up for discussion at the conference of the National Apple Show, but at this date no report has been received of the action taken by the growers at this conference, but this year's experience seems to justify the conclusion previously expressed editorially in "Better Fruit," that it will be wise for the Northwest to discontinue packing so many grades. There seems reason to believe two grades will be sufficient. Of course the first grade should be Extra Fancy. This grade should be packed strictly in accordance with the present grading rules. The standard of Extra Fancy must be maintained absolutely. It seems to the editor that the Fancy and C grade can be combined in one grade, either to be called "Fancy" or, preferably, "Standard," which has been suggested in Yakima. If two grades are to be packed, then the two grades should take all that are packed as Fancy and a reasonable proportion of C grade, including only that which is really first class. The average grower would probably pack out 50 to 60 per cent of Extra Fancy, about 30 to 40 per cent of Fancy and about 10 to 20 per cent of C grade. If the crop is well sprayed, free from pests, then the C grade would probably not exceed 10 per cent very much, if any. Consequently the grower, in leaving out the poorest of C grade, if he leaves out half of them, would only leave out about 5 per cent of the entire crop, which would bring better prices at the vinegar factory then after paying freight to Eastern markets. The other 5 per cent of C grade, which would be the better apples in the grade, would be only a small proportion of the Standard box, and by being combined with the Fancy would not materially affect the quality of the Standard grade. By combining the best of the C grade with Fancy, calling it Standard or some other suitable name, the grower could afford to make the price on this grade somewhat more reasonable compare to the price on Fancy, thus enlarging the markets. The two-grade plan is suggested editorially in this issue for the purpose of calling attention of all the districts to the matter in order that they may give it proper consideration and come to some agreement before the 1917 apple crop is harvested.

Shortage of Boxes.—For many years apple growers have enjoyed very comfortable apple harvesting seasons. Unfortunately, this year continued severe frosts caused the apples to drop very early, which hurried up the apple-picking season. Owing to a shortage of cars, growers were unable to get boxes as required, consequently many of the growers were seriously delayed in their picking and lost very severely from dropping. Another reason for the shortage of boxes was that growers, when the apples began to fall, picked so much more rapidly than in previous years, many stopping packing altogether, consequently many growers required 50 per cent more to hold the crop unpacked. As they come from the orchard, they usually pack out from 65 to 70 per cent, which meant, this year, growers had to have an excess of 25 to 50 per cent more boxes than they packed out. Invariable in past seasons growers have put off hauling boxes out until the beginning of harvesting. This year the crop overran everyone's estimate, and growers required a great many more boxes than previously ordered. These they were unable to get when the car shortage occured. A lesson is to be drawn from the condition that existed this year. Growers should make more reliable estimates and provide themselves with enough boxes to hold their entire crop. These should be hauled out early in the season instead of waiting until harvesting begins. Harvesting begins in most districts about the first of October. After the first of October this year the increased orders for boxes amounted to about 50 per cent in addition to original orders.

Packing Houses and Warehouses.— Never before in the history of the apple industry of the Northwest has a condition prevailed like the one of 1916, when the picking season was shortened by severe frosts, followed later by weather that was in some districts down to 15 and in some districts even below this. Many growers did not have warehouses sufficient to carry their crop, consequently a great many growwere not able to pick their apples because they did not have warehouses to store them in, and most of these were lost by the drop. Such a season may not occur again for many years, yet on the other hand similar conditions may occur again next year; therefore every grower should provide himself with such accommodations as are necessary to put his crop under protective cover and at the same time protect it from extremely low temperature, which may occur again early in the season or before the grower would have the entire cropt packed out.

The Quantity of Northwestern Apples. It is very difficult at the present time to give very reliable figures on the apple crop of the Northwest for 1916. Shipments have been heavy, exceeding last year, up to date, about 10 per cent. Yet the markets have not been glutted and prices have ruled pretty fair, generally speaking. While it is true a large quantity remains to be disposed of, yet the losses will reduce this quantity, and it is safe to say now that exaggerated predictions in the beginning of the season will probably not be realized, but about as nearly as anyone could make an off-hand guess at the present time it would seem that the crop of the Northwest would be anywhere from 15,000 to 20,000 cars of shipping apples.

Apple Prices for 1916.—Apple prices have ruled fair during 1916 for the Northwestern grower. It is possible, if a large quantity had not been lost from the drop and other causes, the price would have been somewhat affected during the rush of the season, that is, during November and December. In order to move the crop, it might have been necessary for Northwestern shippers to make lower prices, but the situation apparently seems to have been relieved, and while it cannot be said at the present time that the loss is so great that it will raise the price to any great extent, it is undoubtedly true that the loss is large enough, so that what remains to be shipped will not be so great in quantity as to glut the markets or crowd any of the principal consuming centers. The distribution is greater this year than in any previous year, covering some 446 cities and towns in the United States during the month of November. The shortage of cars is such that, although there is a large quantity of apples to be shipped, yet they cannot be moved at any time in large enough numbers to seriously affect any of the markets, consequently at the present time it looks as if the grower would get fair prices for apples this season. At the same time if the markets are not glutted, the dealers who handle the Northwestern product will save themselves from any loss through speculation. It is mighty important that the dealers should make money in the apple business. Just as important in a way as for the grower to make money, because if the dealer does not make a profit he is not very anxiouns to be a purchaser next year, except at very low figures.

Marketing Cull Apples.—Good markets, like Portland, Seattle, Tacoma and Spokane, have been flooded with low-grade apples from the districts of the Northwest, which has been a serious menace to shipping concerns securing satisfactory prices for the better grades. It is a fact that many growers, after packing out three grades, box up the rest of the stuff, and instead of sending it to the vinegar factory, ship it out as cooking apples, or under some

other name more frequently. It is generally true, with very few exceptions, that the price realized for such stuff does not pay the grower any profit, not even what he could get if he sold them to the vinegar factory or evaporator. Worse than this, however, are the windfall apples, which growers continue to perists in packing up and disposing of at very low figures, which is poor stuff, rotting very rapidly, which has a very unfavorable influence on the marketing conditions, and at best growers very seldom realize anything more out of such apples than the cost of preparing them for market—in fact, seldom more than he could get if he sold to the vinegar factory. These two practices must be discontinued if the growers want to realize satisfactory prices on good grades.

1916 Apple Season.—The 1916 apple season was certainly a very peculiar year causing severe loss to many growers who were not properly equipped for housing safely their crops under the weather conditions that prevailed. The loss from the dropping was extremely heavy. The loss from apples unpicked during the cold spell in the latter part of November, when the temperature was very low in many cases, was severe to many individual growers. It is difficult to estimate what the loss may be from these causes at the present time, but in all probability the loss would vary anywhere from 15 to 25 per cent in the various districts.

Barren Trees Made to Produce

By Thos. J. Talbert, Specialist in Entomology, Kansas State Agricultural College.

ONE of the most successful fruitgrowers of Kansas, Mr. John Alter of Belle Plaine, has, by a girdling process, caused barren Mammoth Black Twig apple trees to bear from eighteen to twenty-five bushels per tree. These apple trees were eighteen years old and they had never borne a crop of apples. Mr. Alter had called them fine shade trees, but worthless as fruit trees. The trees are growing on Arkansas River Valley land which is well adapted to the growth of apple trees. The orchard had received good care from the beginning, and other varieties such as Winesap, Jonathan, Ben Davis and Grimes Golden had been fruiting well and heavily in the same orchard for several years. Finally Mr. Alter concluded that something must be done because he was cultivating, spraying and pruning a large area that had never given him any returns. He had heard and read of girdling trees to make them more fruitful. He was also familiar with the barbaric practices of driving rusty nails and railroad spikes into fruit trees to induce them to fruit. After studying the different methods of girdling carefully and getting advice from a member of the Agricultural Experiment Station, he decided to girdle the trees, although most of the advice was against the process.

The work was done in the spring of 1914, just as the buds began to open out into clusters and when the pink in

the opening blossoms began to show. Three different methods of girdling were practiced as follows: (1) A strip of bark varying from one-quarter to one-half inch wide was taken out of the tree about two feet above the ground by cutting around the tree and taking out a piece of bark six or eight inches long. About an inch strip was then left on or skipped and another piece of bark six or eight inches long and one-half inch wide was taken out. This process was continued until the trunk of the tree had been treated all the way round. The wounds were painted at once with white lead and raw linseed oil. (2) This method was similar to the first except the strips between the cuts were left five or six inches wide instead of one inch in width. (3) This method consisted of removing a series of diamond-shaped section of bark from the trunk about two feet above the base. These sections were continued around the tree, leaving a strip of bark about six or eight inches wide between the wounds. The sections of bark removed were eight or ten inches long up and down and about three or four inches in width at the widest place. (4) A half dozen or more trees in the same block were left untreated.

Last year all the trees that were girdled according to method one averaged from 18 to 25 bushels a tree. The trees girdled according to methods two and three bore but very little fruit. In fact they were no more fruitful than the ungirdled trees. The results this year showed up just as they did last year. The trees girdled according to the first method were heavily loaded with fruit, while the other trees had large leaves and made much twig growth, but set very little fruit. Again, there was no more fruit on these trees than there was on the untreated trees. It is interesting to note that in all the girdling work carried on by Mr. Alter he has not damaged a single tree. The wounds were carefully made with clean, sharp tools and they were treated at once with ordinary house paint. As a result not a single case of rot or disease can be found starting in the old wounds. The old practice of driving rusty nails and railroad spikes into apple and pear trees to cause them to fruit has been abandoned. Such work may cause the trees to fruit, but it at the same time allows fungous diseases and rots to become established in the trunks of the trees, which soon destroys them.

The problem which confronted Mr. Alter was, "How can I check the heavy vegetative growth of the trees and cause them to fruit without, at the same time, making them more liable to attacks by fungous diseases and insect pests?" Sowing grass in the orchard and allowing it to remain in sod for a few years had been recommended as a means of checking the growth of the trees and producing fruit. Likewise summer pruning had been urged upon him as the best means of producing fruit on the barren trees. Neither of these methods were tried out thoroughly, but Mr. Alter's long experience in fruit growing had taught him that insect pests and fungous diseases were much harder to control in a sodded orchard than in a well-cultivated orchard. He also learned that pruning during May and June often caused a heavy flow of sap from wounds down the large limbs and trunks of the trees, making a very favorable place for fungi and insects to get a start. Mr. Alter is watching the experiment closely and he is anxious to know how long the effects of the first-girdling process will last; that is, when will regirdling be necessary in order to keep the trees fruiting under the present cultural methods. While girdling has never been generally recommended, yet in the hands of the experienced orchardist it may become a useful practice. The work which Mr. Alter is doing is very commendable and no better demonstration of apple-tree girdling can be found anywhere than that on his farm. Horticulturists have been profited and will continue to be benefited by this work.

"Every place and every job have difficulties, the more so when they are new, and while every job has difficulties it also has opportunities. But no job ever grows until brains are applied to it."—Through the Meshes.

Two Destructive Scale Insects

[Office of Information, United States Department of Agriculture]

SPECIALISTS of the United States Department of Agriculture report that the oyster-shell scale and the scurfy scale are more frequently the subject of inquiry by orchardists and others than all other species of scale insects combined, with the exception of the San Jose scale. These scales often kill individual branches and permanently stunt or, in extreme cases, kill the tree. Although the insects winter in the egg stage under the protecting scales and are, therefore, less susceptible to washes that are effective against the San Jose scale, yet such treatment in most cases will reduce their numbers to a point where little injury from them will result. Special spraying may be necessary to hold them in check if spraying for the San Jose scale is not carried on.

The oyster-shell scale is the more important of the two. It occurs in nearly every state in the country and attacks apple, maple, horse chestnut, poplar, willow, lilac, and more than a score of other trees. Shade trees which are not often sprayed are especially susceptible to attack. Maple and poplar trees in some cases are completely incrusted from top to bottom of the trunk. The insect owes its name to its resemblance to a long, narrow oyster shell. The adult female scales are dark-brown in color and about one-eighth of an inch in length. The eggs are concealed beneath them. In the warmer climates there are two broods each year, but in the extreme northern part of the country and in Canada there is only one. The time of the hatching of these broods varies greatly, but it usually occurs through the months of April, May and June.

The scurfy scale is especially common on apple, pear, cherry and peach trees. It does not attack as wide a variety of plants as the oyster-shell scale, and this fact, coupled with its being less widely distributed than the latter, makes it the less harmful of the two. The scurfy scale, like the oyster-shell, winters in the egg condition under the scales. The scale of the female is dirty gray in color and of an irregular pear shape.

Where orchards are pruned and sprayed regularly for the San Jose scale during the dormant period, this will usually be sufficient to hold both the oyster-shell and the scurfy scale in check. Where this is not done and the scales prove troublesome, specific treatment is necessary. The spraying is usually done in the same manner as for the San Jose scale, using the lime-sulphur mixture and applying it when the trees are dormant. If an abundance of young scales hatch in the spring notwithstanding such treatment, additional spraying is necessary. Kerosene emulsion or other contact sprays may be used to kill the newly-hatched insects. Only the insects hit by the spray are killed; therefore the effectiveness of this second spraying depends largely upon whether it is done at the time the scales hatch, and whether the tree is thoroughly covered with a uniform coat. The young insects usually appear during the spring and sometimes in the early summer. Trees which have become infested should be carefully watched during this period to discover the insects when they hatch and to apply the spray at this time when it will do the most good. The insects are easily distinguished, are light yellow in color, and are found crawling over the trees in great numbers.

Directions for the mixing of lime-sulphur spray and kerosene emulsion are contained in a new Farmers' Bulletin, No. 723, "The Oyster-Shell Scale and the Scurfy Scale," by A. L. Quaintance and E. R. Sasscer, containing complete data on these scales and additional methods for their control.

Kerosene emulsion is made after the following formula: Kerosene (coal oil, lamp oil), 2 gallons; fish-oil or laundry soap (or 1 quart soft soap), ½ pound; water, 1 gallon. First dissolve the soap in boiling water, then remove the vessel from the fire. Immediately add the kerosene, and thoroughly agitate the mixture until a creamy solution results. The stock emulsion may be more conveniently made by pouring the mixture into the tank of a spray pump, and pumping the liquid through the nozzle back into the tank for some minutes. The stock solution, if well made, will keep for some months, and is to be diluted before use. To make a 10 per cent spray (the strength for trees in foliage) add to each 1 gallon of the stock solution about 5⅔ gallons

of water. For 20 and 25 per cent emulsions (for use on dormant trees and plants) use, respectively, about 2⅓ and 1⅔ gallons of water for each 1 gallon of stock emulsion. Agitate the mixture in all cases, after adding the water. The preparation of the emulsion will be simplified by the use of a naphtha soap. No heat will be required, as the kerosene will combine readily with the naphtha soap, in water, when thoroughly agitated. Double the quantity of naphtha soap given in the above formula, however, will be required, and soft or rain water should be used in making the emulsion. In regions where the water is "hard" this should first be broken with a little caustic potash or soda, as common lye, before use for dilution, to prevent the soap from combining with the lime or magnesia present, thus liberating some of the kerosene, or rain water may be employed.

A good lime-sulphur wash may be made for immediate use by the following formula: Stone lime, 20 pounds; sulphur (flour or flowers), 15 pounds; water to make 50 gallons. Heat in a cooking barrel or vessel about one-third of the total quantity of water required. When the water is hot add all the lime and at once add all the sulphur, which perviously should have ben made into a thick paste with water. After the lime has slaked, about another third of the water should be added, preferably hot, and the cooking should be continued for one hour, when the final dilution may be made, using either hot or cold water, as is most convenient. The boiling due to the slaking of the lime thoroughly mixes the ingredients at the start, but subsequent stirring is necessary if the wash is cooked by direct heat in kettles. If cooked by steam, no stirring will be necessary. After the wash has been prepared it must be well strained as it is being run into the spray tank. It may be cooked in large kettles, or preferably by steam in barrels or tanks. This wash should be applied promptly after preparation, since, as made by this formula, there is crystallization of the sulphur and hardening of the sediment upon cooling.

Cover Crops in Young Orchards

Continued from last issue

Throughout the entire Okanogan country orchards which are clean cultivated and are on light virgin soil are very susceptible to rosette; yet wherever the soil has been improved with leguminous cover crops this trouble is not found. Often times in answer to my inquiry the farmer will say, "Oh, yes, I used to be bothered with it, but since I put clover or alfalfa in my trees I have never been bothered with it any more."

During the interval between planting and producing, the expense of maintaining the orchard is very great, generally working hardships on the owners, who have paid high prices for the land. Many orchardists are growing nothing between their trees, buying all their produce and going into debt more and more each year, anxiously awaiting the first crop of fruit. The following statistics have been carefully obtained and apply to Okanogan County, where $350 per acre is paid for a one-year-old orchard, and no returns are obtained from cover crops in the six-year interim until bearing, the orchard will have to produce 1,000 boxes of apples per acre per year, which must sell for one dollar a box in order for the owner to realize an eight per cent interest on his investment. Some men have made money from the cover crops and catch crops while waiting for their trees to bear. One who had thirty acres all in alfalfa this year harvested seventy tons of alfalfa from the first three cuttings. He has been offered $7.50 per ton for the entire crop, but refuses to sell it. In caring for his alfalfa he has cared for his trees. He has been growing alfalfa among his trees for seven years and says he has never had any trouble selling his hay.

The question of stomach sprays injuring the value of the hay has been brought up. I have never found a farmer yet who complained about this.

In the last month I have asked thirty-one of the largest cover crop growers, and their reply is that with a reasonable amount of care, and where the hay is in strips, no danger will be experienced. A man who wishes to grow fruit alone and who starts out with a one or two-year-old orchard has a very expensive proposition. The cost of maintaining his family in the country will be greater than in the city. There is no income and a very great expense for five years. The only solution is the cover crop and the money crop system. Splendid vegetables can be grown in any soil which will produce good fruit. From a measured orchard acre one farmer sold this year tomatoes which brought a gross return of $340. Another man had fifteen acres in corn, which averaged forty bushels per acre, besides the valuable feed. From five acres of strawberries another man cleared $500. Many farmers report yields of from 200 to 250 bushels of potatoes, while nowhere do roots such as stock beets and carrots thrive better.

The money crop system is to rotate soil building crops with one of the above named crops. Keeping the land planted in legumins for two or three years, then putting in a money crop, then plant a soil building crop again. A well managed twenty-acre tract will, in addition to growing thrifty young trees, produce enough hay and roots for four horses, four cows, fifteen hogs and one hundred and fifty chickens. And most important of all, when the trees are six years of age and ready to begin to bear large crops of fruit, the soil will not be in an exhausted condition, as is often the case where clean cultivation is practiced, but it will be found to be very rich, responsive, and very satisfactory to handle.

To the Growers of Roses

This is to inform you that members of the American Rose Society have been raising money to co-operate in employing a trained plant pathologist to investigate diseases of roses. Sufficient money has now been obtained to assure this work, which is already under way. Doctor L. M. Massey of the New York State College of Agriculture, Cornell University, Ithaca, is conducting the investigations. It is hoped that all growers of roses will now take advantage of this arrangement, not only to obtain what little information there is already at hand, but to co-operate in ways which will be suggested from time to time. Through co-operation with Dr. Massey, the growers will greatly increase the efficiency of the investigation and obtain the greatest returns from their investment.

First of all it seems desirable to make a rose disease survey such as will acquaint us with the various diseases, together with their range and the extent of injury caused by them in this country. In order that this survey may reach its maximum efficiency, it will be necessary for the growers to co-operate by sending specimens of diseased plants. Franked tags will be supplied on request. It is hoped that each grower will interest himself in this work sufficiently to collect and send diseased material, together with a brief statement regarding varieties affected, nature and extent of injury, time of appearance of the disease, and other points of interest which may have been noticed. Acknowledgment of receipt of material will be made and such information as is available in the line of control will be given. Many growers will be visited, but it is hardly necessary to say that it will be impossible to visit all.

The material sent should be freshly collected and should show various stages in the development of the disease. Where roots are sent it will usually be undesirable to enclose any soil. Where convenient, specimens should be mailed so as to reach Ithaca the latter part of the week. Dr. Massey may be away from the city during the early part of the week and the material should receive immediate attention upon its arrival. Place leaves,

buds, etc., between the leaves of an old newspaper, a few between each two sheets. Then roll into a tight bundle, wrap in stout paper. Tie well, attach one of the franked tags on which you have written your name, address and mail. It will go postage free. Yours for success in this undertaking, H. H. Whetzel, head of the Department of Plant Pathology, New York State College of Agriculture, Cornell University.

The Leaf Blister Mite

Red or green blister-like spots appearing in the early spring on the foliage of the apple and pear are usually due to the leaf blister mite. This is not an insect, but a small animal, invisible to the unaided eye, which attacks standard varieties of pear and apple trees and often inflicts serious damage. Where trees are seriously infested, the premature fall of both fruit and leaves may result. In such cases a special application of lime-sulphur wash or other spray may be necessary. Ordinarily, however, the regular orchard spraying is sufficient to control the mite. Badly-infested branches of the pear trees may be cut off and burned. Care should be taken not to confuse the work of the mite with the leaf-spot disease or the results of heavy spraying.

Describing the leaf blister mite, showing how it may be recognized, and giving methods for its control, the United States Department of Agriculture has issued a new Farmers' Bulletin, No. 722, "The Leaf Blister Mite of Pear and Apple," by A. L. Quaintance. The leaf blister mite passes the winter beneath the bud scales. There it waits for the opening of the buds and attacks the young leaves as soon as they push out in the spring. The tiny animals bore small holes from the underside of the leaves into the interior, where they lay their eggs. This causes the small, pimple-like galls on the upper surface of the leaves. The spots later increase in size, sometimes to one-eighth of an inch, and on the pear tree are red and often brilliantly colored as they grow. In the case of the apple, the eruptions lack the more brilliant coloring and are found more along the margin of the leaf. In both cases the spots finally turn brown or black, and if the pest is abundant the leaves become ruptured and wrinkled.

More than 250 varieties of apples are attacked by the mite, injury being especially severe on some well-known commercial sorts, such as the Ben Davis, the King, Baldwin, Rhode Island Greening, and the Williams Favorite. Where orchards are seriously infested, as has been noted in New York State, lime-sulphur washes give excellent results. They avoid the injurious effects upon fruit buds which sometimes result from the use of oil sprays. The wash should be applied thoroughly, coating the twigs and branches.

A standard solution of kerosene emulsion may also be used. The stock solution should be diluted with five parts of water for spraying purposes. One application should be given in the late fall, as soon as most of the leaves have fallen, and another in the following spring, before the trees put out foliage. If it is possible to give only one treatment, the sprays should be used in the fall. At this time many of the mites have not yet gone to the bud scales, but occur in the down covering the young wood, and hence are more easily killed.

Nothing is impossible; there are ways which lead to everything, and if we had sufficient will we should always have sufficient means.—Le Rouchefoucald.

Die when I may, I want it said of me by those who know me best that I always plucked a thistle and planted a flower where I thought a flower would grow.—Abraham Lincoln.

Northwest Apple Movement for November

Apple shipping concerns and growers can spend some time very profitably in looking over the following list of towns to which apples of the Northwest have been shipped from November 1st to 24th, inclusive. Comparisons should be made with October shipments, which appeared in the November edition. Thirty towns have been added to the list during the month of November, which shows an increase of approximately 10 per cent wider distribution. Boston received 106 cars, Minneapolis 241, New York 409, Philadelphia 66. The population of Philadelphia is about twice that of Boston, and Philadelphia received less than half as many cars as Boston, yet Boston is located in Massachusetts, and the New England States have long been celebrated for producing large quantities of good apples. Many other comparisons can be drawn, which will prove very positively that many cities have not received or consumed the quantity of Northwestern apples that they should in accordance with what are being consumed in other cities. There must be reasons. The subject is worthy of careful study. It is believed that by careful investigation the conditions, whatever they are, may be overcome so that arrangements could be made that each city would consume its just proportion of Northwestern apples. Careful study of the list of cities will show that some very small towns have received apple shipments in car lots, and it is also true there are many towns in the United States of medium size that should receive in car lots that are not included in this list. Everybody is extremely busy at the present time, therefore it seems wise to postpone a more detailed analysis of the lessons that may be drawn from these lists until some later issue of "Better Fruit." It is our intention, toward the end of the season, to analyze this list more completely, calling special attention to some of the cities which have not assumed their just proportion, and also mentioning other cities in the United States which should receive Northwestern apples and are not.

Albuquerque, N. M.	1	Bridger, Mont.	2
Atlanta, Ga.	1	Burt, N. Y.	3
Avon, Minn.	1	Bowman, N. D.	2
Am'rie'n Falls, Ida.	1	Bozeman, Mont.	5
Almena, Kan.	2	Bridgeport, Conn.	6
Aberdeen, S. D.	23	Birmingham, Ala.	4
Arimo, Idaho	1	Bangor, Me.	1
Abilene, Tex.	5	Beach, N. D.	1
Arlington, Kan.	1	Billings, Mont.	19
Anaconda, Mont.	2	Bismarck, N. D.	18
Austin, Tex.	6	Baker, Oregon	1
Altamont, Kan.	1	Belgrade, Mont.	1
Ashley	1	Bowman, Mont.	2
Arco, Idaho	1	Brush, Colo.	2
Albert Lea, Minn.	1	Braddock, N. D.	1
Alexandria, La.	1	Bynum, Mont.	1
Blackfoot, Idaho	2	Bisbee, Arizona	4
Bonham	1	Buhl, Idaho	1
Bancroft	1	Biggerville, Pa.	2
Bend, Oregon	1	Bellinger, Wis.	1
Broadhead, Wis.	1	Ballard, Wash.	1
Black Duck, Minn.	1	Benito, Mass.	1
Brady, Mont.	2	Brownsville, Tex.	1
Boston, Mass.	106	Big Springs, Tex.	1
Baltimore, Md.	23	Beloit, Wis.	1
Beaumont, Tex.	2	Browning, Mont.	1
Brigham, Utah	1	Brewster, Minn.	1
Butte, Mont.	23	Brownwood, Tex.	1
Buffalo, N. Y.	9	Chicago, Ill.	318
Birmingham, Ala.	16	Chamberlain, S. D.	1
Burt, N. Y.	22	Carmot	1
Boise, Idaho	14	Conrad, Mont.	3

Cutbank, Mont.	17	Houston, Tex.	13
Claremont, S. D.	2	Helena, Mont.	10
Cameron, Man.	2	Hazelton, N. D.	1
Cincinnati, Ohio	17	Hoquiam, Wash.	2
Cody, Wyo.	1	Hopewell, Ill.	1
Calgary, Alberta	7	Hazelton, Idaho	1
Cuero, Tex.	1	Hoxie	1
Clinton, Iowa	1	Herndon, Kan.	1
Chinook, Mont.	1	Havre, Mont.	6
Crawford, Neb.	5	Hastings, Neb.	1
Cumberland, Iowa	1	Huron, S. D.	1
Council Bluffs	3	Hartford, Conn.	2
Condon, Kan.	1	Hottinger, N. D.	4
Cedar Rapids, Ia.	2	Hanna, Wyo.	1
Coffeyville, Kan.	1	Horton, Minn.	2
Camanche, Okla.	1	Hale, Mo.	1
Columbus, Ohio	3	Harrington, Okla.	1
Cheyenne, Wyo.	14	Hill City, S. D.	1
Corsicana, Tex.	5	Hebron, N. D.	1
Cambria, Iowa	1	Hersey City, N. J.	1
Centralia, Wash.	1	Haxtun, Colo.	1
Crookston, Minn.	5	Ithaea, N. Y.	1
Cando, N. D.	1	Idaho Falls, Idaho	2
Colorado Springs	2	Indianapolis, Ind.	4
Caldwell, Idaho	1	Jersey City, N. J.	3
Cleveland, Ohio	6	Jamestown, N. D.	9
Chehalis, Wash.	2	Jacksonville, Fla.	2
Columbus, Neb.	1	Java, S. D.	1
Creelman, Sask.	1	Kansas City, Mo.	60
Canova, S. D.	1	Kamsack, Sask.	1
Cresco	1	Killdeer, N. D.	1
Casper, Wyo.	1	Krupp, Wash.	1
Coffee Creek, Mont.	1	Klamath F'lls, Ore.	1
Cass Lake, Minn.	1	Kenmore, N. D.	1
Crosby, Minn.	1	LeRoy, N. Y.	16
Cartonville	1	Lewiston, Mont.	5
Denver, Colo.	42	Laurel, Mont.	5
Dallas, Tex.	23	Laramie, Wyo.	2
Duluth, Minn.	35	Lethbridge, Alb'rta	7
Danbury, Neb.	1	Langdon, N. D.	2
Deer Lodge, Mont.	1	Los Angeles, Cal.	36
Des Moines, Iowa	11	LaCross, Wis.	1
Denison, Tex.	2	Lincoln, Neb.	8
Devils Lake, N. D.	3	Little Rock, Ark.	4
Detroit, Mich.	4	Lyons, N. Y.	12
Dalton, Minn.	2	Logan, Utah	2
DeBuque, Iowa	3	Lamond, Alberta	1
Diekinson, N. D.	12	Lemmon, S. D.	2
Dike, Iowa	1	Lake Park, Minn.	1
Dunsmuir	2	Livingston, Mont.	4
Dillon, Mont.	2	Long Island, Kan.	1
DeBois, Pa.	1	Lester, Neb.	2
Drake, N. D.	1	Logansport, Ind.	1
Douglas, Ariz.	2	Lakota, N. D.	1
Drummond, Mont.	1	Lake Charles, La.	1
Davenport, Iowa	2	Llano, Tex.	1
Detroit, Minn.	1	Leith, N. D.	1
Dilworth, Minn.	1	Minot, N. D.	17
Dighton	1	Minneapolis, Minn.	241
Deadwood, S. D.	1	Muskogee, Okla.	1
Edmonton, Alberta	5	Milw'd Spur, Utah	1
Elmira, N. Y.	6	Mitchell, S. D.	5
Ennis, Tex.	1	McAlester, Okla.	1
Edison, N. D.	1	McCauley	1
El Paso, Tex.	13	Minn. Tr'ns., Minn.	32
Emmett	3	Milwaukee, Wis.	20
Everett, Wash.	6	Milk River, Alb'rta	1
Eureka, Kan.	2	Moosejaw, Sask.	6
Emporia, Cal.	2	Manchester, N. H.	1
Eastby	1	Minidoka, Idaho	1
Evansville, Ind.	3	Medina, N. Y.	2
Eagle Bend, Minn.	1	Muskogee, Okla.	1
Enterprise, Oregon	1	Malvern, Iowa	2
Eureka, S. D.	1	Malta, Mont.	1
Elsworth, Kan.	1	Marshall, Tex.	2
Fort Morgan, Colo.	1	Memphis, Tenn.	3
Forsythe, Mont.	3	Marysville, Cal.	3
Fort Worth, Tex.	45	Middleton, Idaho	1
Fargo, N. D.	16	Mandan, N. D.	1
Fort Smith, Ark.	3	Missoula, Mont.	6
Fairmont, Neb.	1	Muskogee, Okla.	3
Fernie, B. C.	2	Miles City, Mont.	1
Fort Fairfield, Me.	1	Mott, S. D.	1
Freeport, Ill.	2	Morris, Minn.	1
Fort Wayne, Ind.	2	Morrison	1
Fredericksburg	1	Montpelier, Idaho	1
Fergus F'lls, Minn.	2	Medicine Hat, Alb.	4
Flasher, N. D.	1	Miles City, Mont.	2
Fort Clark, N. D.	1	Moore	1
Fort Morgan, Colo.	1	McCloud	1
Fresno, Cal.	2	Moorefield, Neb.	1
Franklin, Mont.	1	Muskogee, Okla.	2
Fairfield, Idaho	1	Moorefield, Neb.	1
Great Falls, Mont.	13	McCammon, Idaho	1
Grand Island, Neb.	3	Montague, Cal.	1
Grand Forks, N. D.	5	Midvale	1
Glasgow, Mont.	3	McDonald, Kan.	1
Grainfield, Kan.	1	Meridian, Idaho	1
Groton, S. D.	1	Michland, Idaho	1
Gothemburg, Neb.	1	Malad, Idaho	1
Glendive, Mont.	4	Montreal	1
Gregory, S. D.	1	New York	409
Globe, Ariz.	1	New Lond'n, Conn.	1
Genesee, Idaho	1	Nashville, Tenn.	8
Gull Lake, Sask.	1	New Orleans	14
Great Falls, Mont.	1	Ness City, Kan.	1
Gillette, Wyo.	1	Nampa, Idaho	15
Galesburg, Ill.	1	North Bend, Ore.	1
Gorham, Kan.	1	Norton, Kan.	1
Gooding, Idaho	2	Norfolk, Kan.	2
Gillette, Wyo.	1	New Rockf'rd, N.D.	1
Giltner, Neb.	1	Norris, Mont.	1
Geraldine, Mont.	1	New Salem, N. D.	1
Goodrich, N. D.	1	North Platte, Neb.	1
Globe, Ariz.	1	Norris, Mont.	1
Gering, Neb.	1	Newberg, N. D.	1
Hutchinson, Kan.	1	Niagara, Oregon	1
Hannibal, Mo.	10	Ogden, Utah	11
Hinsdale, Mont.	1	Omaha, Neb.	131
Highmoore, N. D.	1	Oklah'ma City, Ok.	2

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

Olympia, Wash...	67	Sintinta, Sask....	1
Oakland, Cal.....	9	St. Anthony, Idaho	2
Oxbow, Sask.....	1	San Jose, Cal.	1
Ontario, Oregon ..	2	Sheridan, Wyo. ..	4
Oakes, N. D.	2	Sterling, N. D.....	1
Ottumwa, Iowa ..	1	Sumner, Wash....	3
Oshkosh, Wis. ...	2	Sidney, Mont.	1
Oberlin, Kan.....	1	Superior, Wis. ...	2
Ottawa	1	Stockton, Cal.....	4
Parker, S. D.	1	South Bend, Ind..	1
Philadelphia, Pa..	66	Stanford, Cal.	1
Pittsburg, Pa.....	17	Sherman, Tex. ...	1
Pocatello, Idaho..	11	Sweet Water, Mont.	1
Payette, Idaho....	58	Scotts Bluff, Neb..	2
Purple Spr'gs, Alt.	1	St. Francis, Kan..	1
Pueblo, Colo.	4	St. Augustine, Fla.	1
Purcell, Idaho....	1	St. Joseph, Mo....	2
Providence, R. I..	3	Sheldon, N. D....	1
Portland, Me.	12	Smiths Ferry, Ida.	1
Plankenton, S. D..	1	Salina, Kan.	1
Parma, Idaho	1	Shoshone, Idaho..	1
Portland, Oregon..	32	San Pedro, Cal....	1
Pine Bluffs, Wyo.	1	Tulsa, Okla.....	18
Parshal, N. D.....	1	Tacoma, Wash....	29
Pony, Mont.	1	Twin Falls, Idaho.	2
Phoenix, Ariz. ...	1	Tyler, Tex.	1
Picabo, Idaho	1	Traer, Kan.	1
Preston	1	Trinidad, Colo....	1
Peoria, Ill.	1	Tuton, S. D.	1
Puyallup, Wash..	1	Tucson, Ariz.	1
Rugby, Mont.	1	The Dalles	1
Redfield, S. D. ...	1	Toronto, Ontario..	3
Racine, Wis.	2	Topeka, Kan.	4
Regan, N. D.	1	Townsend, Mont..	1
Regina, Sask.....	9	Twin Falls, Idaho.	1
Red Lake Falls, Minn.	1	Toledo, Ohio	2
Reno, Nevada.....	2	Twin V'lley, Minn.	1
Rupert, Idaho	3	Three Forks, Mont.	1
Rexburg, Idaho ..	1	Turtle Lake, N. D.	1
Ree Heights, S. D.	1	Timber Lake, S. D.	2
Rock Spr'gs, Wyo.	7	Texarkana, Ark...	2
Rosebud, Mont....	1	Upton, Wyo.	1
Roundup, Mont...	1	Utica, N. Y.	1
Riverton, Neb. ...	1	Upland, Neb.	1
Raymond, Minn...	1	Vancouver, B. C...	17
Rhome, Tex.	1	Vermillion, S. D..	1
Rockford, Ill.	2	Valley City, N. D.	2
Red Lodge, Mont.	1	Vulcan, Kan.	1
Rapid City, S. D..	1	White Fish, Mont.	29
Ruby	1	Wiliston, N. D....	5
St. Johns, N. B....	12	Worcester, Mass..	5
Salem, Oregon ...	3	Weiser, Idaho	1
Simpson, Kan....	1	Winnipeg, Man....	6
St. Thomas, N. D.	1	Wolf Creek, Mont.	1
San Marcos, Tex..	1	Wichita, Kan.....	4
San Angelo, Tex...	3	Washington, D. C.	8
Stanford, Mont....	1	Wilson, N. Y.	4
Seattle, Wash.....	86	Waterloo	2
Suspension Bridge, N. Y.	65	Wheaton, Minn. ..	1
Spokane, Wash....119		Wallace, Idaho ...	2
Sioux City, Iowa..	16	Waco, Tex.	7
Salt Lake	25	Weed, Cal.	1
San Francisco ...	37	Whitewater, Kan..	1
Shawnee, Okla....	2	Wichita F'lls, Kan.	1
Sacramento, Cal...	12	Warren	1
San Diego, Cal....	4	Watertown, Minn.	1
Sioux Falls, S. D.	19	Watertown, Neb...	1
St. Paul, Minn....	33	Woodruff, Kan....	1
St. Louis, Mo.....	27	Webster, S. D....	1
Saskatoon, Sask...	8	Werner, N. D.....	1
Shreveport, La....	11	White Lake, S. D.	1
Springfield, Mass..	5	Wahpeton, N. D...	5
Sterling, N. D.....	3	Wilmar	1
Sumner, Wash. ...	7	West Hope, N. D.	1
Starkw'ther, N. D.	1	Wahpella, Sask...	1
San Antonio, Tex.	7	Wausau, Wis.	1
St. Maries, Idaho.	1	Wolsey, S. D.....	1
St. Cloud, Minn...	2	Wendell, Idaho ..	1
		York, N. D.	1

Maintaining Soil Fertility, Etc.

Continued from page 8

usually assigned to phosphoric acid, potash and nitrogen in commercial fertilizers, and are possibly somewhat too high from a practical standpoint. On the other hand, it must be borne in mind that no account is taken of the value of manure for improving the mechanical condition, drainage of soils and the effect manure has on the chemicals of the soil. Every forkful of manure contains millions of bacteria which have a beneficial effect on the soil to which it is applied. I may say at this point that a better understanding of the bacteria of the soil will explain many of the difficult problems that confront the soil chemist and the soil physicist.

Rotation of Crops.

The influence of rotation in the yield of crops is very marked and is well illustrated by the Rothamsted wheat experiments. The yield of wheat grown continuously without manure for fifty years has been reduced from 33½ bushels, the average maintained on the best fertilized plat, to 15 bushels. Where wheat has been rotated with roots, barley, clover, beans, or fallow, the wheat being sown every fourth year for forty-four years, without the addition of manure or fertilizers of any kind, the yield of wheat has not been sensibly reduced.

The ultimate success of the fruit grower of Washington will depend on his ability to maintain the fertility of his land. Our orchards have been planted, for the most part, on sagebrush or pine lands, and in most cases the land was cleared of the native growth and planted directly to trees. Thus there was little or no vegetable matter in the soil, and since our growers, until recently, have been very insistent on clean cultivation, and stable manure is scarce, on account of the scarcity of farm animals, little has been added. Does it not stand to reason that continued cropping to any tree fruit will bring the same disastrous results that befell the wheat growers?

On account of the nature of his plants (trees) the grower must grow his crop on one parcel for land for a long period of time. Therefore it is difficult or almost impossible to get the beneficial effects of rotation of crops. How, then, are we to maintain the fertility of our orchard lands? This can be answered in one statement: apply barnyard manure. The judicious use of "companion crops," "shade crops" or "cover crops" in the orchard will take the place of rotation of crops on the general farm and also add humus and nitrogen when legumes are used. The "companion crop" and stock make it possible to have barnyard manure on the fruit farm. Alfalfa makes one of the best and cheapest companion crops and is successfully grown in many orchards in the Northwest. After it is established in the orchard it is handled in one of the following ways with success, depending on the soil and the man: (1) Disk thoroughly in the spring and let grow the balance of the season with-

out any more work. (2) Disk thoroughly in the spring and clip the alfalfa as often as it reaches eighteen inches in height and allow the hay to remain in the orchard for a mulch. (3) Disk thoroughly in spring and harvest one or two crops of hay. Some growers plow shallow in the spring instead of using the disk, others use the alfalfa renovator instead of the disk. There are a few who do their disking in the fall. The third way is the best, provided the hay is fed on the place and the manure is put back on the orchard.

Many other crops can be grown in the orchard where moisture is abundant, and they should all be fed on the place. A shade crop is a crop that is grown during the summer to shade the soil and is plowed under in the fall. In orchards where the moisture is not sufficient to support the trees and a companion crop, cover crops can be used. Cover crops are sown in late summer or early fall and plowed under the following spring. Wheat, rye, barley, rape, turnips, peas and vetch are used for cover crops. We have found hairy or winter vetch gives the best results. One seeding is all that is necessary, provided it is not plowed under before it blooms. After it is plowed clean culture can be practiced until fall, and before winter the soil will be covered with a mat of vetch. Vetch furnishes large quantities of humus and fibre to the soil and it is a great nitrogen gatherer. It becomes a weed, but is a good weed in the orchard.

Barnyard manure is the only remedy for orchards that are not sufficiently supplied with moisture to grow cover crops.

It is not advisable to use commercial fertilizers on a large scale until they have been tried with success on a small scale. They are expensive and do not add humus.

The growing of one crop on the "ranch" is rapidly becoming a thing of the past, because it depletes the soil fertility and gives an income but once in the year.

You must apply the methods best suited to your conditions.

World Economy of Food.

The International Institute of Agriculture at Rome has issued an extensive report on the food question, which it says is very grave. It is estimated that 2,300,000,000 bushels of wheat will be consumed in the year ending July 31, 1917, which will decrease the world's surplus to 46,000,000 bushels. The world's surplus of the five cereals, wheat, rye, barley, oats and corn, is placed at 533,000,000 bushels. This includes the stocks in Russia, Roumania and Bulgaria that cannot be exported.

It is announced that a steamship line is to be established between Japan and Brazil. The first steamer, which will be of 5,000 tons register, will leave Japan next February, carrying in addition to cargo 900 emigrants. It is stated that beginning with February 5,000 Japanese will be sent to Brazil each year, to be employed in the cultivation of rice, beans, potatoes, onions and coffee.

"Bulk" Pruning Question

Continued from page 6.

little, if at all, in general form; but the rate of growth of nearly all of its individual parts is accelerated, and the ways in which they function are materially changed, for strengthened and enlarged spurs bear fruit more regularly. Here, then, is a type of pruning that has apparently affected the tree as a whole, affected the tree as a whole because affecting nearly all of its individaul parts. However, it is a type of pruning that must be regarded as the opposite of bulk pruning. Of course it is an extreme case, but nevertheless it serves to illustrate the point that it is desired to emphasize.

Interpretation of the Facts Presented.

A consideration of the facts that have been cited leads unmistakably to at least one conclusion, namely, that the radius of influence within the tree of any pruning (i.e., the cutting out or cutting back of any particular shoot or branch) is comparatively narrow. Parts close to the pruning wound, or perhaps close to space left by the removal of a branch, show a response to the pruning treatment. Roughly speaking, other parts of the tree do not. In other words, pruning does not directly effect the tree as a whole, but it affects it only indirectly through its effect upon individual parts. Why such is the case is, of course, another question. No attempt is made to suggest an answer here. Probably much careful work will have to be done before a satisfactory answer will be forthcoming. Meanwhile the principle established may be of use, even though we are not able fully to explain it.

Application of the Principle Established to Pruning Practice.

In order that a few of the applications of the principle that has just been stated to pruning practice may be well to make a brief statement regarding some of the main objects that the grower should have in mind when pruning. In other words, why do we prune? There are of course many ends sought in pruning, the relative importance of which vary with soil, elevation, temperature, humidity, disease, variety and many other factors, factors both environmental and those artificially imposed by market demands or the whims of the grower. It is not the intention to attempt even to mention these here. It will be generally agreed, however, that primarily pruning must seek to bring trees into bearing at a reasonably early age and then keep them bearing large quantities of high grade fruit, and this must be done with due regard for keeping down the cost of production. Limiting the discussion now to apples and pears, it may be stated that at least in the case of older trees by far the most of the fruit is borne upon fruit spurs. Pruning should consequently aim to lead to the production of large numbers of fruit spurs and to the regular bearing of those already possessed by the tree, together with the maintenance of a reasonable amount of vegetative growth. It has

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

just been pointed out that bulk pruning is mainly influential in the stimulation of watersprouts, and not the main fruit spur system or normal vegetative growth of the tree. There is certainly very little reason to believe that watersprouts can, or at least do, take the place of the normal vegetative (shoot) growth in contributing to the welfare of nearby fruit spurs and to the welfare of the tree as a whole. Furthermore, they are comparatively slow in developing a fruit spur system of their own; so it may be questioned whether or not they are really very useful in the economy of the average tree (except of course for special purposes, such as rebuilding a new top in cases of renovation, etc.). To stimulate the formation of fruit spurs and to increase the efficiency of those already in our possession requires that pruning must be afforded close to the point where we wish them formed or where they already are, for we have seen that the radius of the influence of pruning is comparatively narrow. This in turn means light, or rather fine, as opposed to coarse pruning. In other words, it means pruning that is distributed throughout the tree top, for the spurs and normal vegetative shoots are thus distributed. Our tendency must be in the direction of the removal or cutting back of a larger number of smaller branches. It will be necessary more and more to get away from the idea of what has been called bulk pruning and to give greater attention to detail. Theoretically, pruning should concern itself mainly with shoots and spurs rather than with older or larger wood. Practically, it should be limited to the shoots, spurs and smaller branches. Of course, in the case of trees that have been neglected for several years, some exceptions must be made. Just because the removal of a larger number of smaller branches necessitates the exercise of better judgment and perhaps takes a little more time and requires greater skill than the removal of a smaller number of larger ones, this should not deter us from the best method of procedure.

Carrying the line of reasoning a step further, it becomes evident that pruning should be a regular, rather than an irregular orchard operation. This is a statement that most growers know to be true from observation and experience, though the reasons therefor may not have been clearly understood. However, the points that have been brought out furnish an explanation of some of the characteristic results following irregular pruning. Trees left unpruned for several years usually seem to demand the removal of some of the larger branches or limbs. This approaches the bulk type of pruning that has been described, and as such stimulates new vegetative growth, rather than invigorating the older fruiting wood; and new vegetative growth in trees of this sort is as apt to increase as to diminish difficulties. If the pruning that is to be afforded our orchard trees is to be such as will help establish and maintain rather than disturb a proper balance between vegetative and fruiting wood it must be attended to every year.

What has been stated should not be regarded as an argument against occasional heavy pruning, i.e., the removal of a considerable amount of growth. Though heavy pruning as commonly done is bulk pruning, this is not necessarily the case. It may consist in the removal of a large amount of shoot growth and small branches, and thus not give rise to watersprouts, but on the contrary stimulate the normal vegetative growth and fruit spur system of the tree. The instance of spur pruning cited in this article is evidence on this point.

Some Questions Raised by the Facts Presented.

That the radius of influence of a particular pruning cut is comparatively narrow seems to be established beyond all question. Just how far that influence extends is only one of a great many unanswered questions. Is the radius of influence of a pruning cut the same when a limb is cut back as it is when it is cut off entirely? Does it depend more upon the size of the wound or the age of the limb? Is it felt to as great a degree by fruiting wood in the neighbor hood of a cut as by more strictly vegetative tissue? Does it depend to any extent upon the season when the pruning is done? For instance, is the radius of influence from a cut made July 1 greater or less than it would be from a similar cut made March 1? To what extent are the fruit spurs of a tree virtually independent of the tree as a whole, and to what extent are the fruit spur and vegetative systems interdependent? If interdependent to a certain degree, how close to a particular shoot must a particular spur be in order to be benefited or injured by it? Is the radius of influence of a particular pruning cut greater or less than that of the part removed? Finally, to what extent are parts of tree tops independent and to what extent are they interdependent? These and other questions are at present unanswered. They are not easy problems to solve, yet they must be solved if we are to have a more perfect understanding of the principles underlying pruning practice.

Fairs, Land and Apple Shows

Cascade International Stock Show, North Yakima, Washington, November 27 to December 2.

International Livestock Exposition, Chicago, Illinois, December 2-9.

Pacific International Livestock Exposition, North Portland, Oregon, December 4-9.

National Western Stock Show, Denver, Colorado, January 20-27.

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